# SWRCB's Low-Threat Petroleum UST Case Closure Policy

## 2012 SAM Fall Forum

*Marina Village, San Diego*
*September 19, 2012*

**Ravi Arulanantham, Ph.D.**
**Geosyntec Consultants**
**Oakland, California**
**rarulanantham@geosyntec.com**

# Low-Threat UST Case Closure Policy

- On May 1, 2012, the State Water Board adopted the Low-Threat Underground Storage Tank Case Closure Policy.
  - See State Water Board Resolution No. 2012-0016.
- The administrative record for the Policy was approved by the Office of Administrative Law (OAL) on July 30, 2012.
- The Policy became effective on August 17, 2012 when the California Environmental Quality Act Notice of Decision was submitted to the Secretary of Resources.

# Low-Threat UST Case Closure Policy Stakeholder Group

Stakeholder Group Members and Affiliation*

- **David Arrieta, Western States Petroleum Association**
- **Ravi Arulanantham, Geosyntec, Environmental Consultant**
- **Kurt Berchtold, Executive Officer, Santa Ana Region RWQCB**
- **Roy Herndon, Orange County Water District**
- **Barry Marcus, Sacramento County Env. Mgt. Dept. (LOP)**
- **Jay McKeeman, CIOMA (CA Independent Oil Marketers)**
- **Markus Niebanck, Amicus, Consultant, Sierra Club Volunteer**
- **David Noren, Board Member, North Coast Region RWQCB**
- **Stephanie Shakofsky, CCLR (Center for Creative Land Recycling)**

*While members provided the perspectives and priorities of their respective stakeholder groups during this work, the opinions stated by group members and the recommendations of this draft policy are those of the participants and not necessarily their affiliated entities.

# Policy Structure

- **Preamble**
- **Criteria for Low-Threat Case Closure**
  - General Criteria (applicable to all sites)
  - Media-Specific Criteria
    - Groundwater
    - Vapor intrusion to Indoor Air
    - Direct Contact
    - Soil Only
- **Post Closure-Eligible Requirements**

# Preamble

- **Discusses the background of California tank cleanup program and UST Cleanup Fund.**
- **Discusses program experiences: a substantial fraction of a release can be mitigated with a "reasonable level of effort"**
- **Acknowledges that residual mass is difficult to completely remove regardless of additional efforts.**
- **Recognizes that natural attenuation is a viable remedial alternative for *residual contamination***
- **Discusses applicability of criteria to non-UST petroleum releases**
- **Incorporates definitions by reference**

While this policy does not specifically address other petroleum release scenarios such as pipelines or above ground tanks, if a particular site with a different petroleum release scenario exhibits attributes similar to those which this policy addresses, the criteria for closure evaluation of these non-UST sites should be similar to those in this policy.

# Criteria For Low-Threat Case Closure General Discussion

States that cases *meeting* the general and media-specific criteria do not require further corrective action and *shall* be issued an NFA letter.

**Caveat 1(the inclusion clause):**

Regulatory agencies should issue an NFA letter for sites that *don't meet* the criteria if they believe that site-specific conditions justify a low threat closure.

**Caveat 2 (the exclusion clause):**

"Unique site attributes" may make application of policy criteria inappropriate. The policy puts the onus on the *regulatory agency* to identify and justify "unique attributes" (by reference to conceptual site model) that make a site ineligible for low-threat closure.

# The General Structure of the Policy

In order to qualify for low-threat UST case closure using this Policy:

- A site must satisfy all of the General Criteria, and
- A site must also satisfy the Media-Specific Criteria for Groundwater, Vapor Intrusion to Indoor Air, and Direct Contact and Outdoor Air Exposure by either:
  - Meeting the '**Tier One Criteria**'

    (Classes, Scenarios/Appendix 1-4, Table 1); or
  - A **Site-Specific Assessment/Analysis**; or
  - **Controlling Exposure**; or
  - Qualifying for an **Exception**
- Notification Requirements, Monitoring Well Destruction Requirement, and Waste Removal Requirement
- ***Professional judgment is required to determine if the appropriate criteria have been met.***

# General Criteria

General criteria that must be satisfied by all candidate sites:

1. **The unauthorized release is located within the service area of public water system;**
2. **The unauthorized release consists only of petroleum;**
3. **The unauthorized ("primary") release from the UST system has been stopped;**
4. **Free product has been removed to the maximum extent practicable;**
5. **A conceptual site model that assesses the nature, extent, and mobility of the release has been developed;**
6. **Secondary source has been removed to the extent practicable;**
7. **Soil or groundwater has been tested for MTBE and results reported in accordance with Health and Safety Code Section 25296.15; and**
8. **Nuisance as defined by Water Code section 13050 does not exist at the site.**

# General Criteria (cont..)

1. **The unauthorized release is located within the service area of a public water system**

"….For purposes of this policy, a public water system is a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year."

# General Criteria (cont..)

2. **The unauthorized release consists only of petroleum**

"For the purposes of this policy, petroleum is defined as crude oil, or any fraction thereof, which is liquid at standard conditions of temperature and pressure, which means 60 degrees Fahrenheit and 14.7 pounds per square inch absolute, including the following substances: motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents and used oils, including any additives and blending agents such as oxygenates contained in the formulation of the substances."

# General Criteria (cont…)

3. **The unauthorized (“primary”) release from the UST system has been stopped**

“The tank, pipe, or other appurtenant structure that released petroleum into the environment (i.e. the primary source) has been removed, repaired or replaced….”

# General Criteria (cont…)

4. **Free product has been removed to the maximum extent practicable**

"….In meeting the requirements of this section:

(a) Free product shall be removed in a manner that minimizes the spread of the unauthorized release into previously uncontaminated zones by using recovery and disposal techniques appropriate to the hydrogeologic conditions at the site, and that properly treats, discharges or disposes of recovery byproducts in compliance with applicable laws;

(b) Abatement of free product migration shall be used as a minimum objective for the design of any free product removal system; and

(c) Flammable products shall be stored for disposal in a safe and competent manner to prevent fires or explosions."

# General Criteria (cont…)

5. **A conceptual site model that assesses the nature, extent, and mobility of the release has been developed**

"….The CSM establishes the source and attributes of the unauthorized release, describes all affected media (including soil, groundwater, and soil vapor as appropriate), describes local geology, hydrogeology and other physical site characteristics that affect contaminant environmental transport and fate, and identifies all confirmed and potential contaminant receptors (including water supply wells, surface water bodies, structures and their inhabitants)…. All relevant site characteristics identified by the CSM shall be assessed and supported by data so that the nature, extent and mobility of the release have been established to determine conformance with applicable criteria in this policy. The supporting data and analysis used to develop the CSM are not required to be contained in a single report and may be contained in multiple reports submitted to the regulatory agency over a period of time."

# General Criteria (cont…)

6. **Secondary source has been removed to the extent practicable**

““Secondary source” is defined as petroleum-impacted soil or groundwater located at or immediately beneath the point of release from the primary source. Unless site attributes prevent secondary source removal (e.g. physical or infrastructural constraints exist whose removal or relocation would be technically or economically infeasible), petroleum-release sites are required to undergo secondary source removal to the extent practicable as described herein. “To the extent practicable” means implementing a cost-effective corrective action which removes or destroys-in-place the most readily recoverable fraction of source-area mass. It is expected that most secondary mass removal efforts will be completed in one year or less. Following removal or destruction of the secondary source, additional removal or active remedial actions shall not be required by regulatory agencies unless (1) necessary to abate a demonstrated threat to human health or (2) the groundwater plume does not meet the definition of low threat as described in this policy.”

# General Criteria (cont..)

7. **Soil or groundwater has been tested for MTBE and results reported in accordance with Health and Safety Code Section 25296.15**

"Health and Safety Code section 25296.15 prohibits closing a UST case unless the soil, groundwater, or both, as applicable have been tested for MTBE and the results of that testing are known to the Regional Water Board. The exception to this requirement is where a regulatory agency determines that the UST that leaked has only contained diesel or jet fuel. Before closing a UST case pursuant to this policy, the requirements of section 25296.15, if applicable, shall be satisfied."

# General Criteria (cont…)

8. **Nuisance as defined by Water Code section 13050 does not exist at the site**

“Water Code section 13050 defines "nuisance" as anything which meets **all** of the following requirements:

(1) Is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property.

(2) Affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal.

(3) Occurs during, or as a result of, the treatment or disposal of wastes.

For the purpose of this policy, waste means a petroleum release.”

# Criteria For Low-Threat Case Closure: Media-Specific Criteria - *Groundwater*

- **General discussion of the intent and compatibility with existing statutes, codes, and regulations**

  Resolution No. 92-49 does not require that the requisite level of water quality be met at the time of case closure; it specifies compliance with cleanup goals and objectives within a *reasonable time frame* ("decades to hundreds of years" - Matthew Walker petition, 1998)

  **If the closure criteria described in this policy are satisfied at a release site, water quality objectives will be attained through natural attenuation within a reasonable time, prior to the need for use of any affected groundwater.**

  The area of the plume that exceeds water quality objectives must be *stable or decreasing* in areal extent. "Stable" is defined as the distance from the release where attenuation exceeds migration.

# Media-Specific Criteria

## 1. Groundwater

"….to satisfy the media-specific criteria for groundwater, the contaminant plume that exceeds water quality objectives must be stable or decreasing in areal extent, and meet all of the additional characteristics of one of the five classes of sites…."

"A plume that is "stable or decreasing" is a contaminant mass that has expanded to its maximum extent: the distance from the release where attenuation exceeds migration."

**'Tier One Criteria'** – Meet all of the characteristics of one of the classes (1-4).

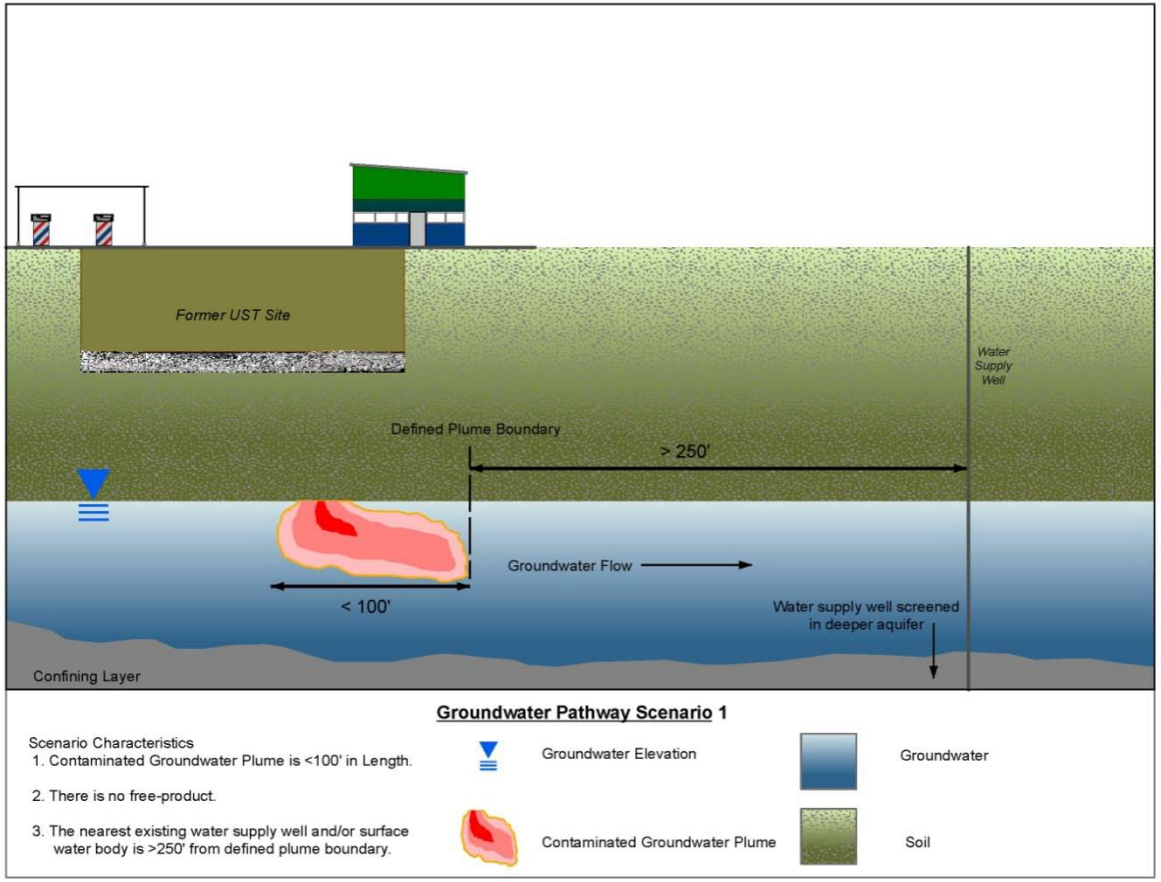
**Site-Specific Analysis** – Meet all of the characteristics of class (5).

"The regulatory agency determines, based on an analysis of site specific conditions that under current and reasonably anticipated near-term future scenarios, the contaminant plume poses a low threat to human health and safety and to the environment and water quality objectives will be achieved within a reasonable time frame."

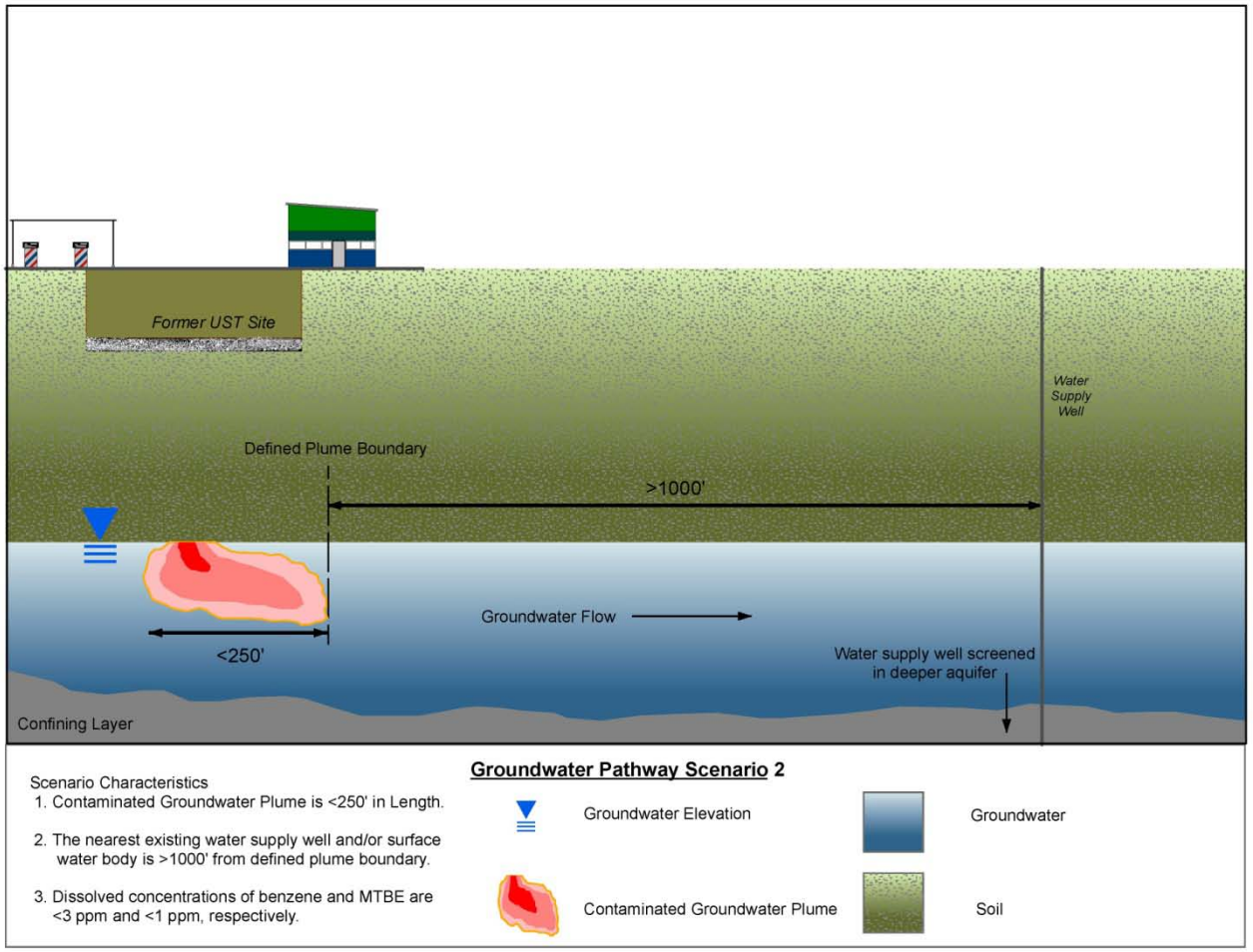
**Exception** – Sites with Releases That Have Not Affected Groundwater "Sites with soil that does not contain sufficient mobile constituents [leachate, vapors, or light non-aqueous-phase liquids (LNAPL)] to cause groundwater to exceed the groundwater criteria in this policy shall be considered low-threat sites for the groundwater medium."

# Media-Specific Criteria

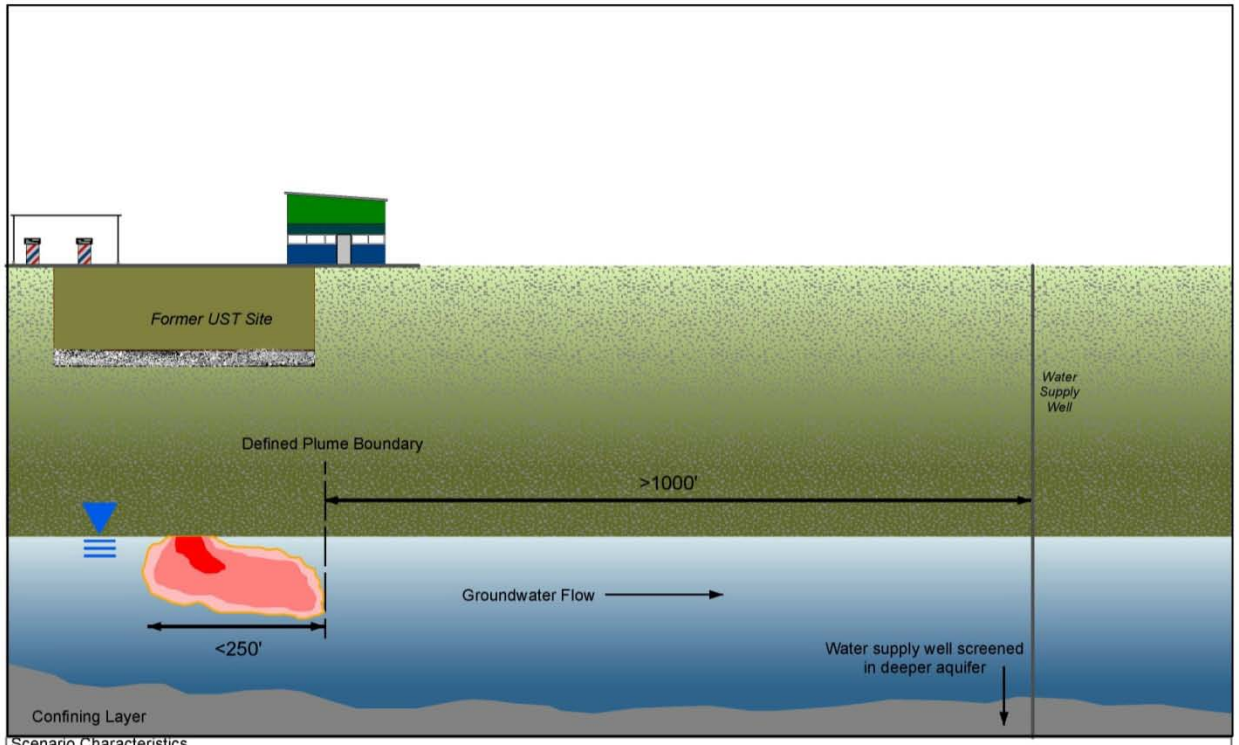
**Groundwater Class 1**



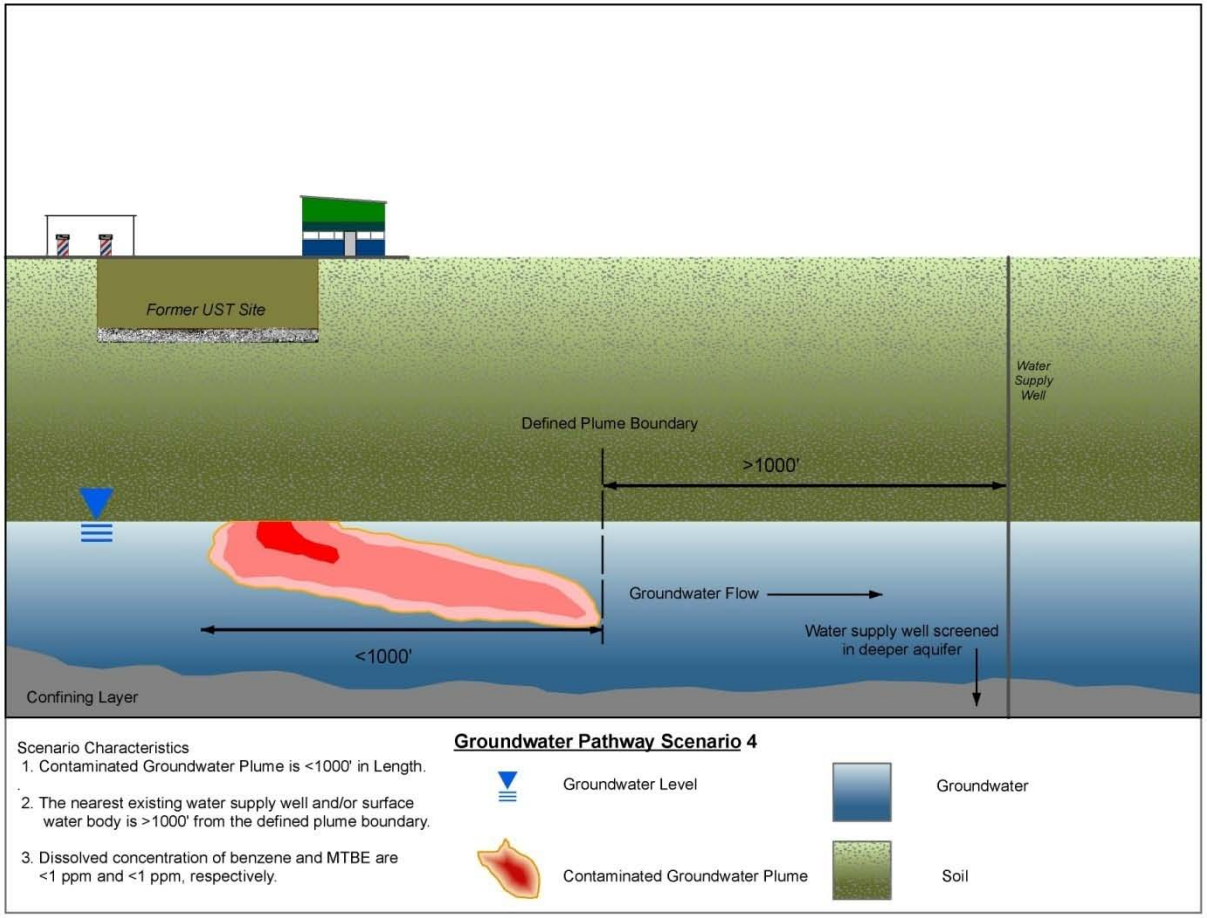
# Media-Specific Criteria **Groundwater Class 2**



# Media-Specific Criteria Groundwater Class 3



# Media-Specific Criteria **Groundwater Class 4**



# Media-Specific Criteria Groundwater Class 5

- An analysis of site specific conditions determines that the site under current and reasonably anticipated near-term future scenarios poses a low threat to human health and safety and to the environment and water quality objectives will be achieved within a reasonable time frame.

# Soil-Only Cases

"Sites with soil that does not contain sufficient mobile constituents (leachate, vapors, or LNAPL)to cause groundwater to exceed the groundwater criteria in this policy shall be considered low-threat sites for the groundwater medium."

# Media-Specific Criteria

## 2. Petroleum Vapor Intrusion to Indoor Air

**'Tier One Criteria'** – "a. Site-specific conditions at the release site satisfy all of the characteristics and criteria of scenarios 1 through 3 as applicable, or all of the characteristics and criteria of scenario 4 as applicable; or"

**Site-Specific Analysis** – "b. A site-specific risk assessment for the vapor intrusion pathway is conducted and demonstrates that human health is protected to the satisfaction of the regulatory agency; or"

**Controlling Exposure** – "c. As a result of controlling exposure through the use of mitigation measures or through the use of institutional or engineering controls, the regulatory agency determines that petroleum vapors migrating from soil or groundwater will have no significant risk of adversely affecting human health."

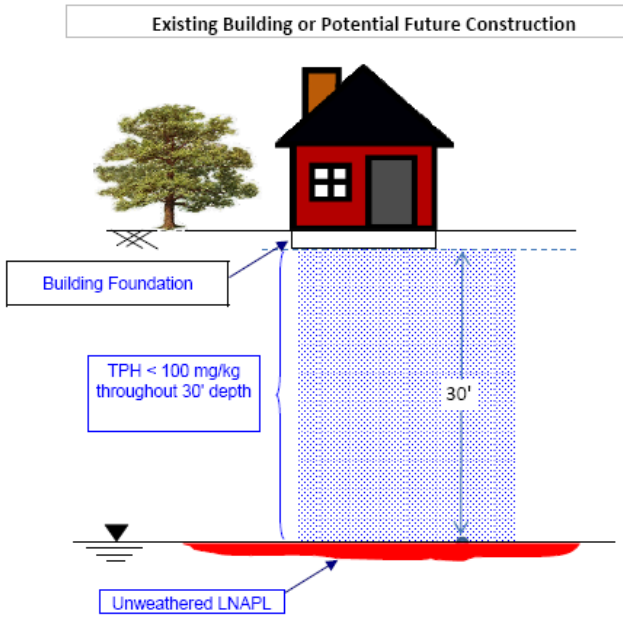
**Exception** – "….Satisfaction of the media-specific criteria for petroleum vapor intrusion to indoor air is not required at active commercial petroleum fueling facilities, except in cases where release characteristics can be reasonably believed to pose an unacceptable health risk."

# Vapor Intrusion

## Scenario 1

**Appendix 1**
**Scenario 1: Unweathered* LNAPL in Groundwater**

**Required Characteristics of the Bioattenuation Zone**




Required Characteristics of the Bioattenuation Zone:
1. The bioattenuation zone shall be a continuous zone that provides a separation of at least 30 feet vertically between the LNAPL in groundwater and the foundation of existing or potential buildings; and
2. Total TPH (TPH-g and TPH-d combined) are less than 100 mg/kg throughout the entire depth of the bioattenuation zone.

*As used in this context, unweathered LNAPL is generally understood to mean petroleum product that has not been subjected to significant volitalization or solubilization, and therefore has not lost a significant portion of its volatile or soluble constituents (e.g., comparable to recently dispensed fuel).

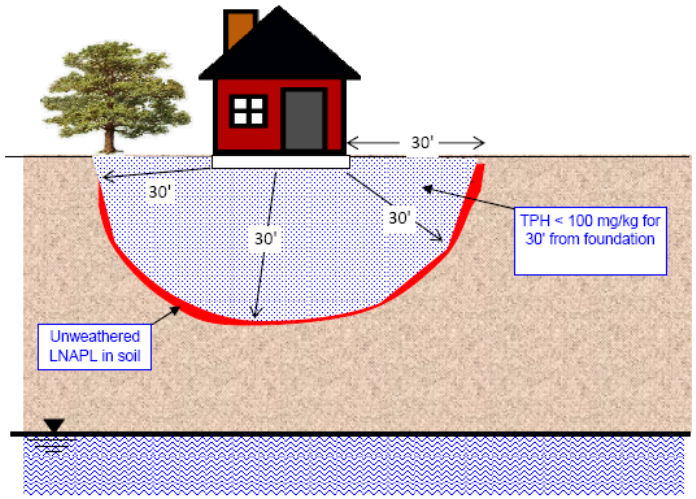
# Vapor Intrusion

## Scenario 2

**Appendix 2**
**Scenario 2: Unweathered* LNAPL in Soil**

**Required Characteristics of the Bioattenuation Zone**

Existing Building or Potential Future Construction




Required Characteristics of the Bioattenuation Zone:
1. The bioattenuation zone shall be a continuous zone that provides a separation of at least 30 feet both laterally and vertically between the LNAPL in soil and the foundation of existing or potential buildings, and
2. Total TPH (TPH-g and TPH-d combined) are less than 100 mg/kg throughout the entire depth of the bioattenuation zone.

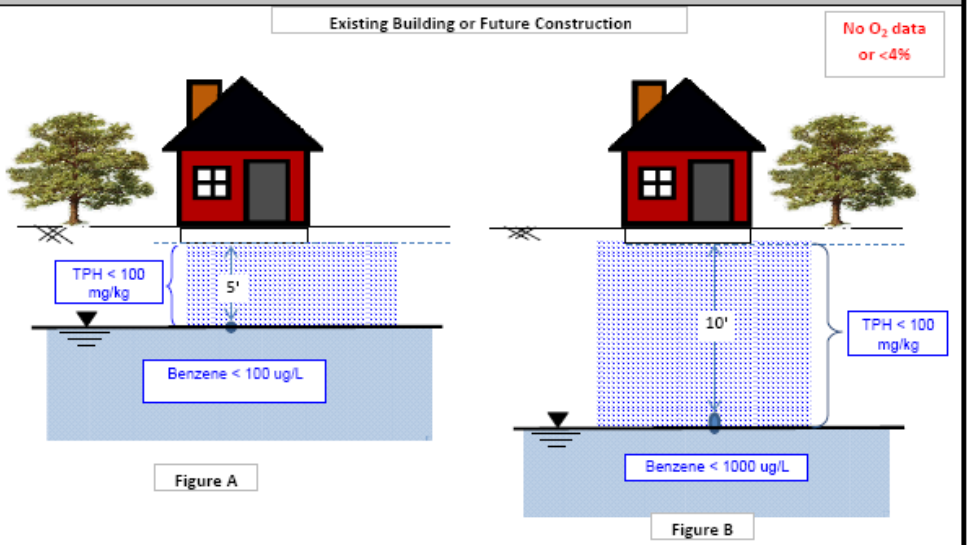
*As used in this context, unweathered LNAPL is generally understood to mean petroleum product that has not been subjected to significant volitalization or solubilization, and therefore has not lost a significant portion of its volatile or soluble constituents (e.g., comparable to recently dispensed fuel).

# Vapor Intrusion

## Scenario 3

Appendix 3
Scenario 3 - Dissolved Phase Benzene Concentrations Only in Groundwater
(Low concentration groundwater scenarios with or without $O_2$ measurements)

**Defining the Bioattenuation Zone Without Oxygen Measurements or Oxygen <4%**




**Required Characteristics of Bioattenuation Zone For Sites Without Oxygen Measurements**

**Figure A:** 1) Where benzene concentrations are less than 100 ug/L, the bioattenuation zone:
a) Shall be a continuous zone that provides a separation of at least 5 feet vertically between the dissolved phase Benzene and the foundation of existing or potential buildings; and
b) Contain Total TPH (TPH-g and TPH-d combined) less than 100 mg/kg throughout the entire depth of the bioattenuation zone.

**Figure B:** 1) Where benzene concentrations are greater than 100 ug/L but less than 1000 ug/L, the bioattenuation zone:
a) Shall be a continuous zone that provides a separation of at least 10 feet vertically between the dissolved phase Benzene and the foundation of existing or potential buildings; and
b) Contain Total TPH (TPH-g and TPH-d combined) less than 100 mg/kg throughout the entire depth of the bioattenuation zone.

# Vapor Intrusion

## Scenario 3 (continued)

### Defining the Bioattenuation Zone With Oxygen ≥ 4%

Existing Building or Future Construction

With $O_2$ data

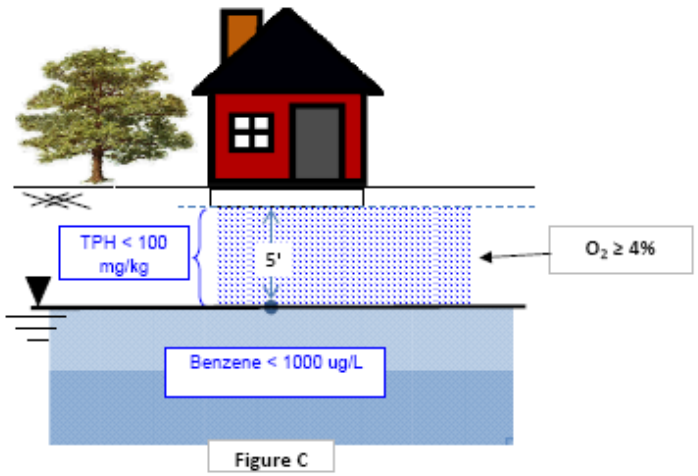



Figure C

### Required Characteristics of Bioattenuation Zone For Sites With Oxygen ≥ 4%

Where benzene concentrations are less than 1000 ug/L, the bioattenuation zone:

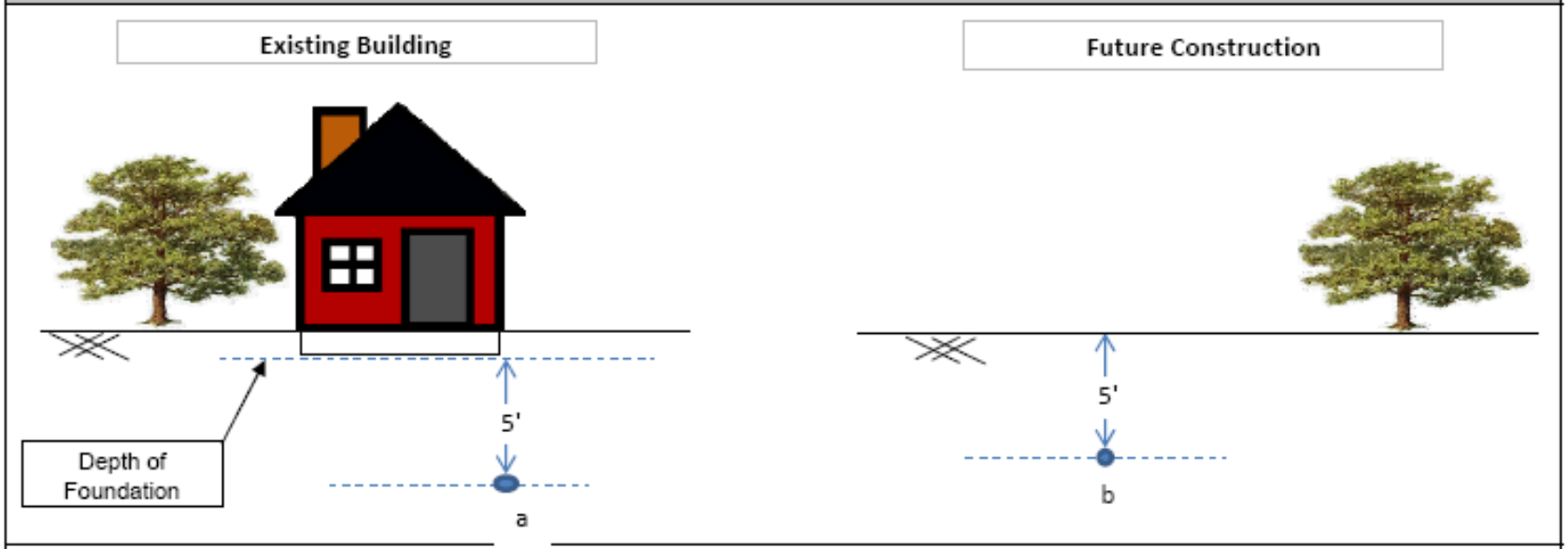
1. Shall be a continuous zone that provides a separation of least 5 feet vertically between the dissolved phase Benzene and the foundation of existing or potential buildings; and
2. Contain Total TPH (TPH-g and TPH-d combined) less than 100 mg/kg throughout the entire depth of the bioattenuation zone.

# Vapor Intrusion

## Scenario 4

**Appendix 4**
**Scenario 4 - Direct Measurement of Soil Gas Concentrations**

**Soil Gas Sampling Locations – No Bioattenuation Zone**



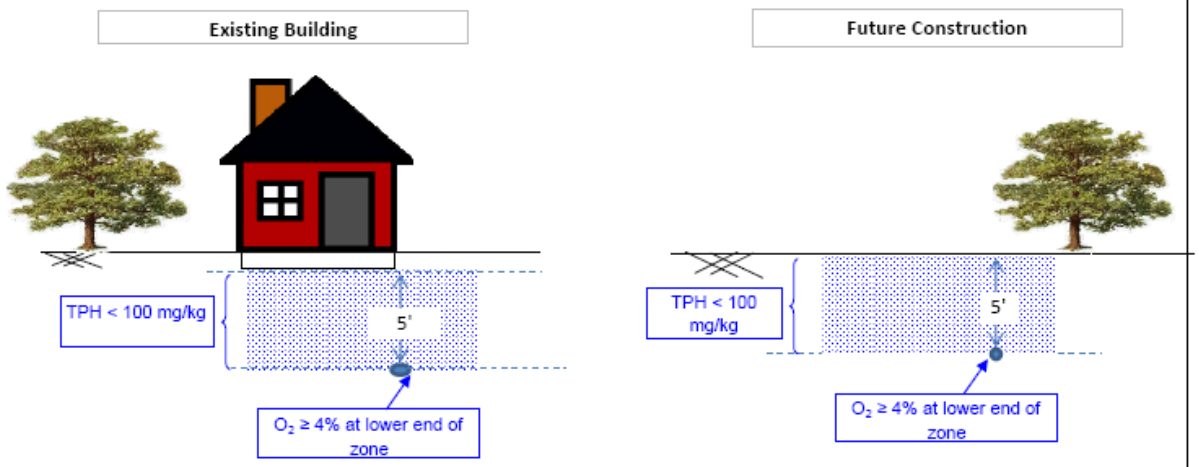

**Description of Soil Gas Sample Locations**

a - beneath or adjacent to building (soil gas sample shall be collected at least 5' deeper than the bottom of the building foundation)
b - for future construction scenarios (soil gas sample shall be collected at least 5' below the ground surface)

# Vapor Intrusion

## Scenario 4 (continued)

**Soil Gas Sampling Locations – with Bioattenuation Zone**




### Required Characteristics of Bioattenuation Zone

Required data includes: petroleum concentrations in soil and soil gas, and oxygen concentrations.

**Measured concentrations of soil gases must be less than the screening values indicated in the table below for the applicable scenarios.**

**Soil Gas Screening Levels ($ug/m^3$)**

| | With Bioattenuation Zone* | | No Bioattenuation Zone | |
|---|---|---|---|---|
| | Residential | Commercial | Residential | Commercial |
| Constituent | Soil Gas Concentration ($\mu g/m^3$) | | Soil Gas Concentration ($\mu g/m^3$) | |
| Benzene | < 85,000 | < 280,000 | < 85 | < 280 |
| Naphthalene | < 93,000 | < 310,000 | < 93 | < 310 |

**Notes:**

*In order to use the screening levels with the bioattenuation zone, there must be:

1) 5 feet of soil between the soil vapor measurement and the building (or future building),
2) TPH (TPHg + TPHd) is less than 100 ppm (measured in at least two depths within the 5 foot zone), and
3) oxygen ≥ 4% measured at the ***bottom*** of the 5 foot bioattenuation zone.

A 1000-fold bioattenuation of petroleum vapors is assumed for the bioattenuation zone.

For the no bioattenuation zone, the screening criteria are the same as the California Human Health Screening Levels (CHHSLs).

# Media-Specific Criteria

## 3. Direct Contact and Outdoor Air Exposure

**'Tier One Criteria'** – "a. Maximum concentrations of petroleum constituents in soil are less than or equal to those listed in Table 1 for the specified depth below ground surface (bgs)…; or "

**Site-Specific Analysis** – "b. Maximum concentrations of petroleum constituents in soil are less than levels that a site specific risk assessment demonstrates will have no significant risk of adversely affecting human health; or"

**Controlling Exposure** – "c. As a result of controlling exposure through the use of mitigation measures or through the use of institutional or engineering controls, the regulatory agency determines that the concentrations of petroleum constituents in soil will have no significant risk of adversely affecting human health."

# Direct Contact

Exposure pathways include inhalation of contaminants volatilized to outdoor air and direct contact with contaminated soil.

# Summary of Soil Screening Levels for Different Exposure Scenarios and Receptors

| Chemical | Residential | | Commercial/ Industrial | | Utility Worker |
|---|---|---|---|---|---|
| | 0 to 5 feet bgs | Volatilization to outdoor air 5 to 10 feet bgs | 0 to 5 feet bgs | Volatilization to outdoor air 5 to 10 feet bgs | 0 to 10 feet bgs |
| | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| Benzene | 1.9 | 2.8 | 8.2 | 12 | 14 |
| Ethylbenzene | 21 | 32 | 89 | 134 | 314 |
| Naphthalene | 9.7 | 9.7 | 45 | 45 | 219 |
| PAH* | 0.063** | NA | 0.68 | NA | 4.5 |

Notes:

* Based on the seven carcinogenic PAHs as benzo(a)pyrene toxicity equivalent [BaPe]. The PAH screening level (applicable to total BaPe) is only applicable where soil was affected by either waste oil and/or Bunker C fuel.

** DTSC (2009) reports average ambient PAH concentrations (as BaPe) in California ranging from 0.16 to 0.21 mg/kg, and upper tolerance limits (UTLs) ranging from 0.9 to 1.5 mg/kg. The screening level shown in this table is "risk-based" and is far below the average ambient concentrations for PAHs in California. It is suggested that DTSC citation (2009) be consulted for sites with PAH contamination.

NA = Not Applicable

# Low-Threat Case Closure

"…. If the case has been determined by the regulatory agency to meet the criteria in this policy, the regulatory agency shall notify responsible parties that they are eligible for case closure and that the following items, if applicable, shall be completed prior to the issuance of a uniform closure letter specified in Health and Safety Code section 25296.10 ."

**"a. Notification Requirements** – Municipal and county water districts, water replenishment districts, special act districts with groundwater management authority, agencies with authority to issue building permits for land affected by the petroleum release, owners and occupants of the property impacted by the petroleum release, and the owners and occupants of all parcels adjacent to the impacted property shall be notified of the proposed case closure and provided a 60 day period to comment. The regulatory agency shall consider any comments received when determining if the case should be closed or if site specific conditions warrant otherwise.

**b. Monitoring Well Destruction** – All wells and borings installed for the purpose of investigating, remediating, or monitoring the unauthorized release shall be properly destroyed prior to case closure unless a property owner certifies that they will keep and maintain the wells or borings in accordance with applicable local or state requirements.

**c. Waste Removal** – All waste piles, drums, debris and other investigation or remediation derived materials shall be removed from the site and properly managed in accordance with regulatory agency requirements."

# Technical Justification

- Technical justification attachments are not part of the policy itself but are included to assist with a technical understanding of how portions of the policy were derived.

- Three sections:
  - Groundwater plume lengths
  - Vapor-Intrusion risk thresholds
  - Direct contact risk thresholds

# Discussion – potential issues requiring regulatory negotiation

Varying interpretation of:

- **“reasonable level of effort”**
- **“to the maximum extent practicable”**
- **“unique attributes”**
- **“bioattentuation zone”**
- **“stable”**
- **“addressed”**
- **“blending agents”**
- **“secondary source removal”**

# Implementation

- **Directs the Regional Water Boards and local agencies, to review all cases in the petroleum UST Cleanup Program using the framework provided in the Policy. This review shall be accomplished within existing budgets and be performed no later than 365 days from the effective date of this Policy.**
- **These case reviews shall, at a minimum, include the following for each UST case:**
- **a. Determination of whether or not each UST case meets the criteria in the Policy or is otherwise appropriate for closure based on a site-specific analysis.**
- **b. If the case does not satisfy the criteria in this Policy or does not present a low-risk based upon a site-specific analysis, impediments to closure shall be identified.**
- **c. Each case review shall be made publicly available on the State Water Board's GeoTracker web site in a format acceptable to the Executive Director**.

# Petition and 5-Year Review Closures

- Petition process still takes ± 1 year
- USTCF 5-year review closures likely to accelerate.

# Questions?

Thank you